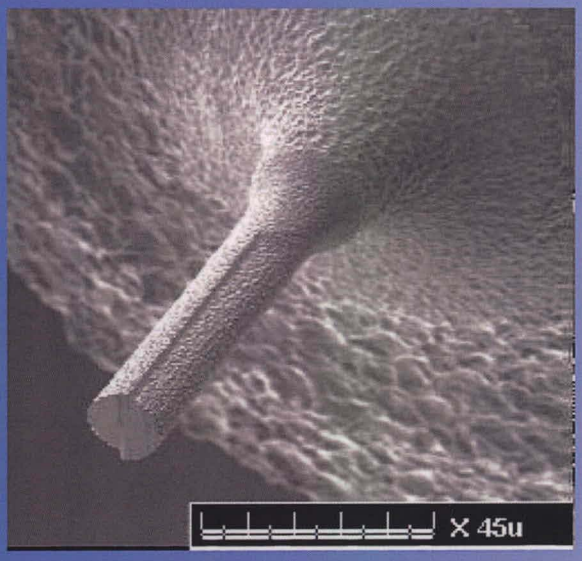
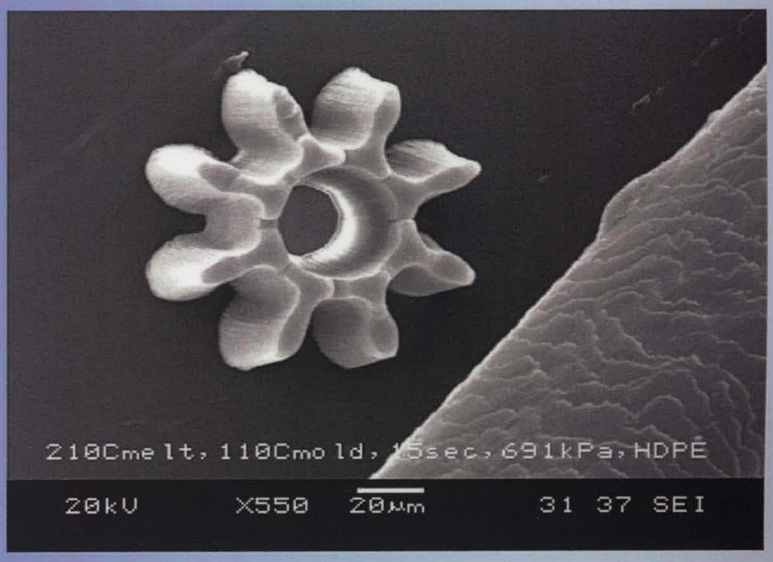
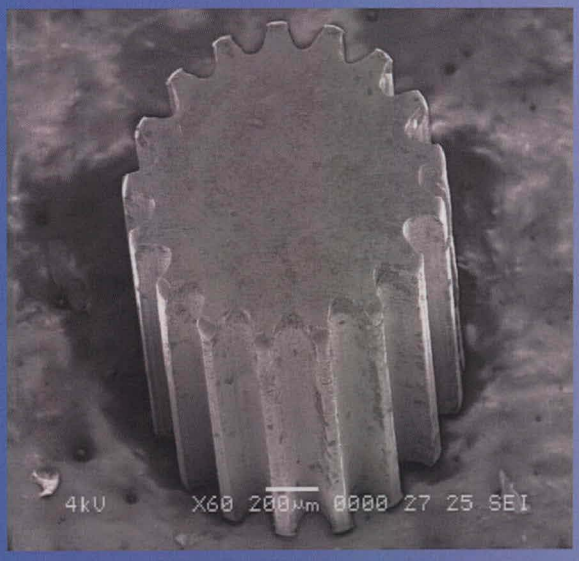
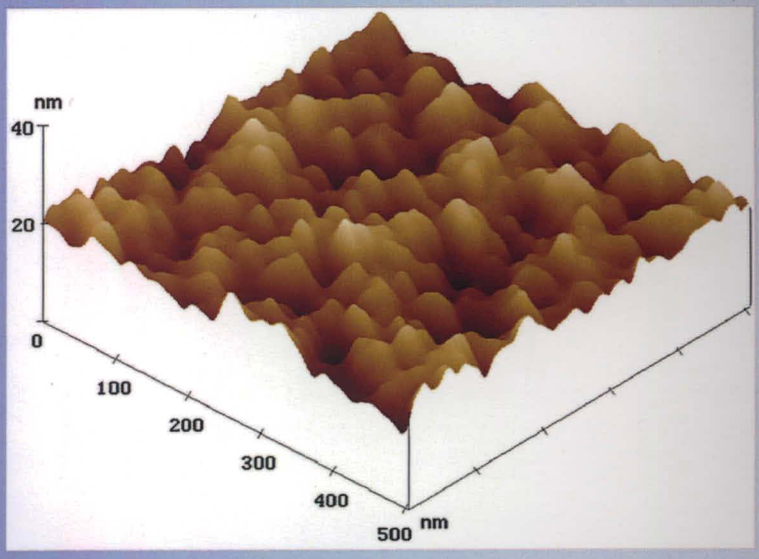
Advanced Machining Process









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Chapter 14

Developments in EDM Process Variables

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Keywords: Electrode Materials, Electrical parameter, MRR, EWR, PMEDM, PM Electrode.

Abstract. The electrical discharge machining (EDM) process parameters (both the input and output) are presented. The input variable of EDM presented here are electrical and non-electrical ones. These are peak current, discharge voltage, pulse cycles (duration and interval), electrode's polarity and gap. The recent advances in areas of both the input and output variables are also presented. The use of powder metallurgy (PM) electrodes and the effects of mixing conductive powders in dielectrics are among the advancements in EDM process.

Introduction

Though EDM is spark erosion process, many other inputs contribute to the successes achieved in machining. This chapter deals with such inputs, their treatments and recent advances attained on them. The inputs in the machining system are generally from the machine tool, the cutting tool and the controlling system. The controlling system is the main features used in powering and regulation of the machine. These basic EDM input process variables have earlier been classified as electrical and non electrical.

The major outputs of the EDM process are the material removal rate, electrode wear rate and surface roughness. Their details, including current developments are presented in the following paragraphs. This chapter is arranged into the sections covering the electrical parameters/settings, the non electrical variables and the EDM process outputs.

Electrical Parameters/Settings

Polarity. This is the direction of current flow in relation to the electrode. The polarity of the electrode can be either positive or negative. In general, electrodes with positive polarity wear better, while electrodes with negative polarity cut faster. Some however do not respond to reverse polarity. Many researches are conducted with negative polarity during machining [1]. Carbide, titanium and copper are generally cut with negative polarity.

Discharge Voltage. This is the preset voltage which determines the width of the spark gap between the electrode edge and workpiece. The higher the voltage settings, the higher the gap and this not only improve the flushing conditions but also help in stabilizing the machining. The machining process outputs (material removal rate (MRR), tool wear rate (TWR) and surface roughness) increases, by increasing open circuit voltage, because electric field strength increases.

Pulse Duration and Interval. The cycle has two distinct times, the on-time and off-time expressed in microseconds. Pulse on-time is also referred to as pulse duration, while pulse